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IS 9638-3 (1985): Fixed Polyester Film Dielectric Capacitors for Direct Current, Part 3: Type FCPE 2 [LITD 5: Semiconductor and Other Electronic Components and Devices]

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UDC 621·319·4 : 621·315·616·96-416 (678·674)

IS : 9638 (Part 3) - 1985

Indian Standard

(Reaffirmed 2002)

SPECIFICATON FOR FIXED POLYESTER FILM DIELECTRIC CAPACITORS FOR DIRECT CURRENT

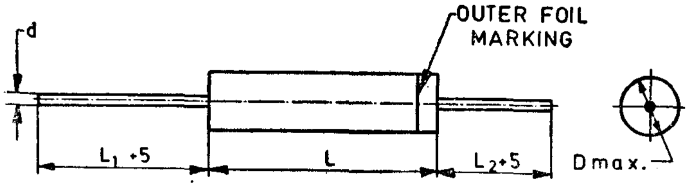
PART 3 TYPE FCPE 2

Capacitors Sectional Committee, LTDC 15 ; Capacitors Subcommittee, LTDC 15 : 1 [Ref : Doc : LTDC 15 (428)]

0. General — This standard (Part 3) shall be read in conjunction with IS : 9638 (Part 1) - 1980 'Specification for fixed polyester film dielectric capacitors for direct current : Part 1 General requirements and methods of tests'.

1. Scope — This standard covers polyester film dielectric capacitors, tubular, non-metal case, insulated, extended foil, low inductance with axial terminations.

2. Outline, Drawing and Dimensions — The outline, drawing and dimensions shall be according to Fig. 1 and Table 1.



All dimensions in millimetres.

FIG. 1 OUTLINE, DRAWING AND DIMENSIONS

Typical Construction : Tubular, non-metal case. Non-hermetically sealed, axial terminations, warp and fill type/moduled type.

Note 1 — Size of terminations:

Case Size ϕD mm	*Diameter of Termination* ϕd mm
$D \leqslant 9$	$0{\cdot}60 \begin{matrix} +0{\cdot}06 \\ -0{\cdot}05 \end{matrix}$
$9 < D < 15$	$0{\cdot}80 \begin{matrix} +0{\cdot}08 \\ -0{\cdot}05 \end{matrix}$
$D > 15$	$1{\cdot}00 \begin{matrix} +0{\cdot}08 \\ -0{\cdot}05 \end{matrix}$

Note 2 — L_1 = 50 mm and L_2 = 40 mm.

TABLE 1 DIMENSIONS AND RATINGS

Capacitance (μF)	100V dc		160V dc		250V dc		400V dc	
	L	*D*	*L*	*D*	*L*	*D*	*L*	*D*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0·001 0	—	—	—	—	—	—	16·5	6·0
0·001 5	—	—	—	—	—	—	16·5	6·0
0·002 2	—	—	—	—	—	—	16·5	6·0
0·003 3	—	—	—	—	16·5	6·0	16·5	6·0
0·004 7	—	—	—	—	16·5	6·0	16·5	7·0
0·006 8	16·5	6·0	16·5	6·0	16·5	6·5	16·5	7·0
0·01	16·5	6·0	16·5	6·5	16·5	6·5	16·5	8·0
0·015	16·5	6·0	16·5	6·5	16·5	7·0	23·0	8·0
0·022	16·5	7·0	16·5	7·5	16·5	7·0	23·0	9·0
0·033	16·5	7·0	16·5	7·5	23·0	7·0	23·0	9·0
0·047	16·5	8·0	16·5	9·0	23·0	8·0	23·0	10·5
0·068	16·5	8·0	16·5	9·0	23·0	9·0	23·0	11·0
0·1	16·5	9·5	23·0	10·0	23·0	10·0	28·0	12·0
0·15	23·0	10·0	23·0	11·0	28·0	11·0	28·0	14·0
0·22	23·0	10·0	23·0	12·5	28·0	11·5	28·0	16·0
0·33	23·0	12·0	28·0	12·5	28·0	14·5	39·0	16·0
0·47	23·0	14·0	28·0	14·5	33·0	14·5	39·0	18·0
0·68	33·0	14·0	33·0	16·0	33·0	17·0	43·0	19·0
1·0	33·0	15·0	33·0	17·5	33·0	19·0	43·0	20·0

Adopted 28 October, 1985

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Gr 3

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

3. Characteristics

a) Selection tolerance	±5 percent, ±10 percent, ±20 percent
b) Vibration	10-2 000 Hz, 200 m/s^2
c) Bump	4 000 bumps, 4 000 m/s^2
d) Shock	1 km/s^2
e) Acceleration	1 km/s^2
f) Climatic category	40/085/21
g) Low air pressure	1 kPa

4. Marking — *See* **7** of IS : 9638 (Part 1)-1980.

5. Material, Construction and Workmanship — *See* **6** of IS : 9638 (Part 1)-1980.

6. Classification of Tests — *See* **8.1** of IS : 9638 (Part 1)-1980.

6.1 *General Conditions for Tests — See* **8.2** of IS : 9638 (Part 1)-1980.

6.1.1 The test schedule and the requirements shall be in accordance with Table 2.

TABLE 2 TEST SCHEDULE AND REQUIREMENTS

Sl No.	Test	Clause Ref in IS : 9638 (Part 1)-1980	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
I) *Group* 0				
	a) Visual examination	8.4.1	—	The workmanship and finish shall be satisfactory. The marking shall be legible.
	b) Dimensions	8.4.2	—	The dimensions of the capacitors and their terminations shall conform to values given in Table 1 read with Fig. 1.
	c) Capacitance	8.3.2	At 1 kHz	The capacitance value shall correspond with the rated capacitance taking into account the tolerance.
	d) Tangent of loss angle	8.3.3	—	The value shall not exceed 0·006.
	e) Outer foil marking	8.3.6	—	Terminal connected to outer foil shall be correctly marked.
	f) Inductance	8.3.5	—	The inductance of the capacitors shall not be greater than the inductance of a straight round wire 0·2 mm in diameter and length equal to that of the capacitors and its terminations (*see* Fig. 2).
	g) Voltage proof	8.3.1	—	There shall be no breakdown or flashover.
	h) Insulation resistance	8.3.4	—	1) Between terminations (at 20°C). For $C \leqslant 0{\cdot}1\ \mu$F - 500 000 MΩ *Min.* For $C > 0{\cdot}1\ \mu$F - 50 000 MΩ μF *Min.* 2) Between terminations and case 30 000 MΩ *Min.*
II) *Group* 1				
	a) Solderability	8.4.4.1	—	The terminations shall get wet easily and the tinning shall be uniform and good.
	b) Robustness of terminations	8.4.3	—	
	1) Visual examination	8.4.1	—	There shall be no damage

(*Continued*)

TABLE 2 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Ref. in IS : 9638 (Part 1)-1980	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
c)	Bump	8.4.6	4 000 Bumps, 400 m/s^2	
	1) Visual examination	8.4.1	—	There shall be damage.
	2) Capacitance	8.3.2	—	The change in capacitance value shall not exceed ±5 percent from the value recorded in Group 0.
	3) Tangent of loss angle	8.3.3	—	As in Group 0.
	4) Insulation resistance	8.3.4	—	As in Group 0.
d)	Vibration	8.4.5	10-2 000 Hz, 200 m/s^2	
	1) Visual examination	8.4.1	—	There shall be no damage.
	2) Capacitance	8.3.2	—	The change in capacitance value shall not exceed ±5 percent from the value recorded in Group 0.
	3) Tangent of loss angle	8.3.3	—	As in Group 0.
	4) Insulation resistance	8.3.4	—	As in Group 0.
e)	Shock	8.4.7	1 km/s^2	
	1) Visual examination	8.4.1	—	There shall be no damage.
	2) Capacitance	8.3.2	—	The change in capacitance value shall not exceed ±5 percent from the value recorded in Group 0.
	3) Tangent of loss angle	8.3.3	—	As in Group 0.
	4) Insulation resistance	8.3.4	—	As in Group 0.
f)	Acceleration (steady state)	8.4.8	1 km/s^2	
	1) Visual examination	8.4.1	—	There shall be no damage.
	2) Capacitance	8.3.2	—	The change in capacitance value shall not exceed ±5 percent from the value recorded in Group 0.
	3) Tangent of loss angle	8.3.3	—	As in Group 0.
	4) Insulation resistance	8.3.4	—	As in Group 0.
g)	Rapid change of temperature	8.5.3	5 cycles of $\frac{1}{2}$ h at -40°C and $\frac{1}{2}$ h at $+85$°C	
	1) Visual examination	8.4.1	—	There shall be no damage.
	2) Capacitance	8.3.2	—	The change in capacitance value shall not exceed ±5 percent from the value recorded in Group 0.
	3) Tangent of loss angle	8.3.3	—	As in Group 0.
	4) Insulation	8.3.4	—	As in Group 0.
h)	Climatic sequence	8.5.1	—	—
	1) Dry heat	8.5.1.2	At maximum category temperature for 16 h	
	i) Insulation resistance (hot)	8.3.4	—	a) Between terminations: For $C \leqslant 0.1\ \mu F$ - 50 000 MΩ *Min.* For $C > 0.1\ \mu F$ - 5 000 MΩ μF *Min.* b) Between terminations and coating — 15 000 MΩ *Min.*

(*Continued*)

TABLE 2 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Ref in IS : 9638 (Part 1)-1980	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	ii) Capacitance (hot)	8.3.2	—	The capacitance change during the test shall not exceed + 5 percent from the value recorded in Group 0.
	2) Damp heat (accelerated) first cycle	8.5.1.3	—	
	i) Visual examination	8.4.1	—	There shall be no damage.
	3) Cold*	8.5.1.4	2h at minimum category temperature	—
	i) Visual examination	8.4.1	—	There shall be no damage.
	ii) Capacitance (cold)	8.3.2	—	The capacitance change during the test shall not exceed – 5 percent from the value recorded in Group 0.
	4) Low air pressure	8.5.1.5	1 kPa	There shall be no breakdown or flashover.
	5) Damp heat (accelerated) remaining cycles	8.5.1.6	One cycle of 24 h at + 55 ± 2°C and RH 95 - 100 percent with no voltage applied	
	i) Visual examination	8.4.1	—	There shall be no damage.
	ii) Voltage proof	8.3.1	—	There shall be no breakdown or spark or flashover.
	iii) Insulation resistance	8.3.4	—	a) Between terminations — Not less than 50 percent of the initial value. b) Between terminations and case — 30 000 M Ω *Min.*
	iv) Capacitance	8.3.2	—	The change in capacitances value shall not exceed ±5 percent from the initial value.
	v) Tangent of loss angle	8.3.3	—	Tan $\delta \leqslant 1{\cdot}2 \times$ initial value.
III)	*Group* 2			
	a) Damp heat (long term)	8.5.2	21 days at + 40°C and RH 90 - 95 percent. No voltage applied	
	1) Visual examination	8.4.1	—	There shall be no damage.
	2) Voltage proof	8.3.1	—	There shall be no breakdown or spark or flashover.
	3) Insulation resistance	8.3.4	—	a) Between terminations – Not less than 50 percent of the initial value. b) Between terminations and case — 30 000 M Ω *Min.*
	4) Capacitance	8.3.2	—	The change in capacitance value shall not exceed ±5 percent from the initial value.
	5) Tangent of loss angle	8.3.3	—	Tan $\delta \leqslant 1{\cdot}2 \times$ initial value.
	6) Solderability	8.4.4.1	—	The terminations shall get wet easily and the tinning shall be uniform and good.

*During the last 10 minutes of the period of exposure the rated voltage shall be applied to the specimens. No breakdown or flashover shall occur.

(*Continued*)

TABLE 2 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Ref in IS : 9638 (Part 1) - 1980	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
IV)	*Group* 3			
	a) Dielectric absorption (not applicable to capacitors of values 0·01 µF or less)	8.3.7	—	Shall not exceed 0·6 percent.
	b) Storage at cold temperature	8.10		
	1) Visual examination	8.4.1	—	There shall be no visual damage.
	c) Endurance	8.8	2 000 h at + 85°C half the specimens shall be subjected to the rated voltage	
	1) Visual examination	8.4.1	—	There shall be no damage.
	2) Capacitance	8.3.2	—	The change in capacitance value shall not exceed ±5 percent from the value recorded in Group 0.
	3) Tangent of loss angle	8.3.3	—	Tan $\delta \leqslant 1{\cdot}2 \times$ initial value.
	4) Voltage proof	8.3.1	—	There shall be no breakdown or flashover.
	5) Insulation	8.3.4	—	a) Between terminations — Not less than 50 percent of the initial value. b) Between terminations and case — 30 000 MΩ *Min.*
V)	*Group* 4			
	a) Mould growth	8.7	—	There shall be no mould growth.
VI)	*Group* 5			
	a) Resistance to solvents	8.4.9	—	
	i) Visual examination	8.4.1	—	There shall be no damage.
	b) Resistance to soldering heat	8.4.4.2	—	
	1) Capacitance	8.3.2	—	The change in capacitance value shall not exceed ±5 percent from the value recorded in Group 0.
	2) Tangent of loss angle	8.3.3	—	As in Group 0.
	3) Insulation resistance	8.3.4	—	As in Group 0.
VII)	*Group* 6			
	a) Salt mist	8.6	—	
	1) Visual examination	8.4.1	—	There shall be no damage.
	2) Voltage proof	8.3.1	—	There shall be no breakdown or flashover.
	3) Insulation resistance	8.3.4	—	As in Group 0.

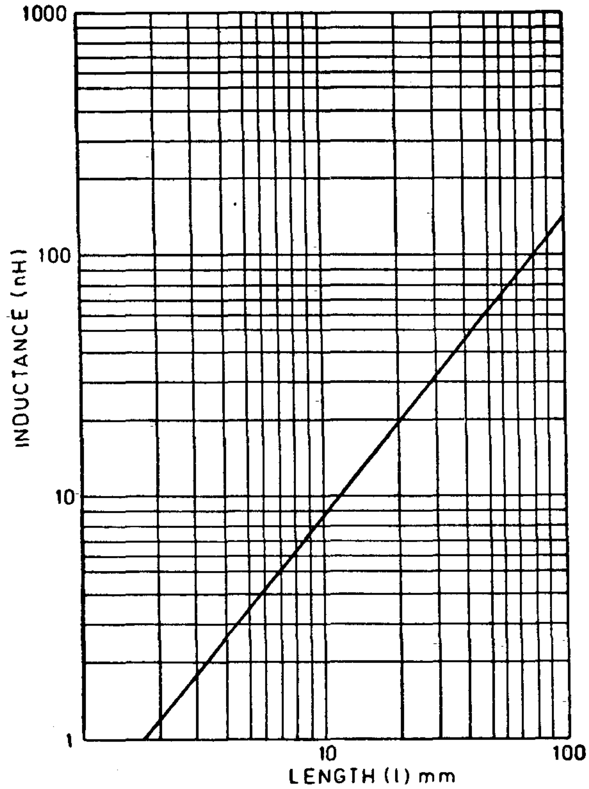

FIG. 2 INDUCTANCE OF STRAIGHT ROUND WIRE, 0·2 mm DIAMETER

EXPLANATORY NOTE

While preparing this standard assistance has been drived from JSS-50212 — Detail specification for capacitors, fixed polyester dielectric. The corresponding JSS Pattern is CQT 03.

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